FORM PTO-1390
REV. 5-93

US DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEYS DOCKET NUMBER
P00,1930

U.S.APPLICATION NO. (if known, see 37 CFR 1.5)
09/743689

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE99/01913	1 July 1999	14 July 1998

TITLE OF INVENTION
"METHOD AND DEVICE FOR OPTIMISING THE TRANSMISSION SAFETY AND THE DEFECT TOLERANCE IN HIGH-BIT-RATE DATA NETWORKS"

APPLICANT(S) FOR DO/EO/US
Jörg KÖPP and Andreas KLUG

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay.
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).)
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C.371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; **(PTO 1449, Prior Art, Search Report).**
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included. **(SEE ATTACHED ENVELOPE)**
13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:
    a. ☒ Submittal of Drawings
    b. ☒ **EXPRESS MAIL #EL 655302982US, dated January 12, 2001.**

U.S.APPLICATION NO. (if known, see 37 C.F.R 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/743689	PCT/DE99/01913	P00,1930

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5): Search Report has been prepared by the EPO or JPO . . . . . $860.00 International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) . . $700.00 No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2) . . . . . $770.00 Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2) paid to USPTO . . . . . $1040.00 International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) . . . . . $ 96.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	3 - 20 =		X $ 18.00	$ .00	
Independent Claims	2 - 3 =	1	X $ 80.00	$	
Multiple Dependent Claims			$270.00+	$	
TOTAL OF ABOVE CALCULATIONS =				$ 860.00	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28)				$	
SUBTOTAL =				$ 860.00	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$ 860.00	
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). $40.00 per property +					
TOTAL FEES ENCLOSED =				$ 860.00	
				Amount to be refunded	$
				charged	$

a. ☒ A check in the amount of $ 860.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 501519. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Schiff Hardin & Waite
Patent Department
6600 Sears Tower
Chicago, Illinois 60606

Steven H. Noll
SIGNATURE

Steven H. Noll
NAME

28,982
Registration Number

IN THE UNITED STATES ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

"PRELIMINARY AMENDMENT"

APPLICANT: Jörg KÖPP et al.

SERIAL NO.: EXAMINER:

FILING DATE: ART UNIT:

INTERNATIONAL APPLICATION NO.: PCT/DE99/01913

INTERNATIONAL FILING DATE: 1 July 1999

INVENTION: METHOD AND DEVICE FOR OPTIMISING THE TRANSMISSION SAFETY AND THE DEFECT TOLERANCE IN HIGH-BIT-RATE DATA NETWORKS

Hon. Assistant Commissioner for Patents
Box PCT
Washington D.C. 20231

DEAR SIR:

Amend the above-identified international application before entry into the national stage before the U.S. Patent & Trademark Office under 35 U.S.C. §371 as follows:

IN THE SPECIFICATION

On page 1, in line 1, delete "Specification";

before the title, insert --

SPECIFICATION

TITLE--;

after the title, insert --

BACKGROUND OF THE INVENTION

Field of the Invention--;

in line 7, delete "according to the preamble of patent claim 1 or 3.";

after line 7, insert --

Description of the Related Art--; and

in line 19, delete "respectively,".

On page 2, in line 14, delete "respectively,".

On substitute page 3, in line 23, delete "respectively,".

On substitute page 4, in line 2, delete "respectively,";

in line 3, delete "respectively,";

in line 19, "**[sic]**";

in line 20, delete "respectively,"; and

after line 22, insert --

SUMMARY OF THE INVENTION--.

in line 26, after "working lines" insert --(working mode)--

in line 27, after "lines," insert --(protective mode)--

On substitute page 4a, in lines 1 and 2, delete "a method in its definition according to patent claim 1 and with an apparatus according to the features of patent claim 3." and insert --a method and apparatus wherein two interface modules are provided in every node of the network. Upon a failure of any of any of these interface units, a signal line change over occurs. Likewise, a failure of a line transmission is countered through the already operating additional interface module.--; and

in line 21, delete "respectively,".

On page 5, after line 9, insert --

BRIEF DESCRIPTION OF THE DRAWINGS--;

delete lines 10 and 11;

in line 13, change "module, and" to --module.--;

after line 15, insert --

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS--;

and

in line 19, delete "respectively,".

On page 6, in line 5, change "held **[sic: reserved]**" to --reserved--; and

in line 8, delete "respectively,".

On page 7, after line 12, add the following new paragraph --

Although other modifications and changes may be suggested by those skilled in the art, it is the intention of the inventors to embody within the patent warranted hereon all changes and modifications as reasonably and properly come within the scope of their contribution to the art.--.

IN THE DRAWINGS

Please amend Figures 1 and 2 to add English text for clarification as shown on the drawing copy marked in red attached to the Request for Approval of Drawing Changes filed simultaneously herewith.

IN THE CLAIMS

On substitute page 8, line 1, change "Patent Claims" to --We Claim:--.

Please cancel all claims without prejudice and add new claims 3-5 as follows:

3. A method for optimizing transmission security and failure security in high-bit-rate data networks via signal line redundancy between network nodes such that parallel signal lines, selectors, bridge circuits, and interface modules provided at a network node side are capable of at least one of being occupied and being switched to at least one of a working mode and a protection mode, said method comprising the steps of:

immediately countering an interface failure error via a signal line changeover, said interface failure error being indicated by at least one of an error message link and a transmission link that are arranged between interface modules

of a network node, said network node being at an end of a signal line pair that includes parallel signal lines for conducting at least one of an incoming and outgoing signal, said parallel signal lines terminated at the network node side with an interface module, said interface module containing via a bridge circuit data transmitted through said parallel lines;

immediately countering a line failure error via a provided interface module redundancy; and

transmitting at least one of line failure messages and interface failure messages between interface modules of incoming and outgoing parallel signal lines in each of network nodes via a selector and at least one of an error message link and a transmission link.

4. A method according to claim 3, wherein the interface modules are being regarded as line components when the selector selects at least one of the parallel signal lines and the signal line pair through which data are forwarded.

5. An apparatus for optimizing transmission security and failure security in high-bit-rate data networks via signal line redundancy between network nodes, such that parallel signal lines, selectors, bridge circuits, and interface modules provided at a network node side are capable of at least one of being occupied and being switched to at least one of a working mode and a protection mode, said apparatus comprising:

at least two interface modules being part of network nodes, each of said at least two interface modules stands in direct connection with a signal line pair that includes parallel signal lines for conducting at least one of an incoming and outgoing signal,

a bridge circuit for routing data coming from a processing unit to the at least two interface modules,

a selector, incoming data present at an output side of said interface module reach the processing unit via said selector, said at least two interface modules always contain via said bridge circuit data that are transmitted via said signal lines, said selector selects via a change over between at least one of a working line

and a protection line upon occurrence of at least one of a line error and an interface module error.

IN THE ABSTRACT

In line 1, change "Abstract" to --Abstract of the Disclosure--;

delete lines 2 and 3;

in line 5, delete "by means of" and insert --via--;

in line 6, replace "whereby" with --such that--;

in line 8, delete "respectively";

in line 10, replace "whereby" with --and--; and

in line 13, change "Error" to --Furthermore, error--.

REMARKS

The foregoing amendments to the specification and claims under Article 41 of the Patent Cooperation Treaty place the application into a form for prosecution before the U.S. Patent and Trademark Office under 35 U.S.C. §371. Accordingly, entry of these amendments before examination on the merits is hereby requested.

Respectfully submitted,

Steven H. Noll (reg. no. ~~31,870~~ 28,982)
Schiff Hardin & Waite
Patent Department
6600 Sears Tower
Chicago, Illinois 60606
Telephone: 312-258-5785

ATTORNEY FOR APPLICANT

Specification

Method and apparatus for optimizing transmission and failure security in high-bit-rate data networks

The invention relates to a method and an apparatus for optimizing transmission security and failure security in high-bit-rate data networks by means of signal line redundancy between the network nodes, whereby parallel signal lines can optionally be occupied, or can be switched, as working lines or protection lines, according to the preamble of patent claim 1 or 3.

Increasing quantities of data to be transmitted and higher demands on transmission security in networks have led to the development of special error-tolerant data transmission protocols and to the provision of line redundancies in order to maintain a desired degree of functioning within a network, via modified transmission paths, in case of hardware or line failures.

The principle of the provision of line redundancies for the maintenance of error-tolerant data transmission networks has long been known, whereby faulty nodes or line segments can be circumvented by the network itself, corresponding to its provided structure, by means of flexible modification of transmission paths.

In the case in which fiber optic transmission paths, i.e., light waveguides, are used, for the signal changeover it is necessary to use optical switching units and multiplexers, but also couplers and splitters. As is known, however, such modules not only result in an increase in the costs in the creation of the network, or, respectively, in the operation of such a network, but undesired attenuations, and thereby signal losses, caused by a worsening of the signal-noise ratio also occur.

In order to avoid standby functions of protective means, including redundant line routing, network structures have been designed that are distinguished by a dynamic selection of connections between the nodes and a correspondingly constructed architecture. However, problems are found here in the necessary centralized or distributed control system that

monitors the individual nodes and lines with respect to the desired transmission characteristics, in order to determine a new connection path in case of failure.

For this reason, on the basis of previously introduced data networks, line redundancy mechanisms, in connection with corresponding data transmission protocols, continue to be used for high-bit-rate transmissions, for example via a multilayer network of the type SONET (Synchronous Optical Network), due to the high demands on availability provided there.

With respect to the line redundancy, it is true that in addition to the actually required signal lines additional lines are also operated in parallel.

What is known as 1+1 line redundancy is widely used, in which the same data transmission quantity or load is sent via two signal lines, and whereby at the receive side in the respective node one of the two lines is used for the further processing of incoming items of information.

In such 1+1 line redundancies, and in an accordingly constructed architecture, signals of the working channel are supplied to a working line and to a protection line via a permanently effective bridge circuit. Both lines accordingly transmit the same signal or, respectively, the same quantity of data, and the respective nodes are in a position to select the signal from one of the two lines via what is known as a selector.

In the terminal nodes, what is known as an automatic protection switching (APS) can then be carried out, whereby in each node, corresponding to the received quality of signals via the two lines, the optimal signal is recognized and the respective line is defined as a working line or working channel.

In the case of a recognized error on the momentary working line, a changeover to the protection line is carried out via the selectors that are provided in each of the nodes.

In the case of what is known as 1:1 line redundancy, the protection line is used to transmit items of information having lower priority; i.e., in contrast to 1+1 line redundancy, the

quantity of information or data is not constantly given on the working and protective line via the bridge circuit. In the case of 1: 1 line redundancy, this bridge function is put into operation only when error functions are present.

If, taking into account the mentioned availability demands and the data transmission security, recourse is had to line redundancies in networks, then the corresponding interface modules must also be present redundantly in a consistent manner, whereby there must be a possibility, given a recognized defect of the active interface module, to change over to an additional module present in standby operation.

As Figure 1 shows, as a schematic representation of a known module redundancy, a standby interface module must accordingly be arranged parallel to the active interface module, whereby corresponding couplers to the working and protection line terminal are necessary.

According to Figure 1, the respective active module terminates the line redundancy, whereby the standby group is then in a position to take over the traffic if the active module fails. The previously active module is then accordingly separated from the line, and the standby group takes over its function by closing of the indicated switch.

The reference EP 0 824 292 A2 relates to a protective switch apparatus for an asynchronous transfer mode connection and a method therefor, in which the protective switch architecture consists of a virtual path group source node, a virtual path group sink node, and an arbitrary number of virtual path group intermediate nodes for the support of the virtual path group. The source node and the sink node are connected by a working line and a protection line, via the intermediate nodes. However, the arrangement shown herein does not comprise two network nodes each having at least two interface modules in which each interface module is respectively connected with a signal line pair for incoming or, respectively, outgoing signal lines. Two interface modules, arranged in parallel, within a network node, which always contain data or items of information that are transmitted via the signal lines – i.e., both are active – likewise cannot be learned from the content of this reference.

The disadvantage of the known module redundancy consists in the necessity of providing couplers or, respectively, modules for signal splitting, and the associated inherent higher expense or, respectively, occurrent signal attenuation. Another disadvantage is that the interface modules, operated either in active mode or in standby mode, require changeover switches for the termination of the respective line, resulting in signal falsifications during the actual changeover process. The interface modules, for example in the case of optical transmission networks, also present a significant cost factor, which increases further if recourse is had to the known solution of the parallel arrangement of modules with the possibility of changeover.

The reference JP-A-9 098 181 relates to a transmitter having a time switch array that, by means of cross connection of an active and a reserve channel, forms a bidirectional transmission network. The respective channel in which an error message occurs is redirected to a reserve channel via switching and bridge means, whereby a bypass for the channel is formed in the network. In addition, two separate transition units are provided for the transmission of signals on the protection line, in the forward direction and in the backward direction. As soon as an error is detected in the transmission lines by an error detection unit 38, the corresponding channel is redirected from the working line to the protection line. From this arrangement it cannot be learned that two interface modules, arranged in parallel, within a network node is **[sic]** equipped with a pair of signal lines for incoming or, respectively, outgoing signal lines, and both interface modules within a node always contain, by means of a bridge circuit, the data or items of information that are transmitted via the signal lines.

The object of the invention is therefore to indicate a method and an apparatus for optimizing the transmission security and failure security in high-bit-rate data networks by means of signal line redundancy between the network nodes, whereby, in a known manner, parallel signal lines can optionally be occupied, or can be switched, as working lines or protection lines, this however being enabled not only given the occurrence of a line error, but also given the occurrence of a failure of an interface module.

AMENDED PAGE

The object of the invention is achieved with a method in its definition according to patent claim 1 and with an apparatus according to the features of patent claim 3.

According to the basic idea of the invention, the previously discretely converted module and line redundancy is combined and unified, it being here understood that, with respect to the handling of errors, the interface modules are to be regarded as part of the line. A failure of the interface modules is accordingly handled by changing over between a working or a protection line. Due to the fact that the interface modules are present in parallel and these parallel modules are constantly active, given the occurrence of a line error only one quasi-changeover is possible, using the selectors that are present anyway, with the omission of additional changeover switches present in the interface module.

According to the invention, each of the parallel signal lines is accordingly terminated at the network node side with an interface module, whereby, as shown, in the normal case all interface modules are in the active state.

Upon failure of one of the interface modules, this failure is countered by a quasi-virtual signal line changeover. The provided interface module redundancy therefore immediately effects an increased degree of security in the case of line errors, whereby in addition error messages can be transmitted between the interface modules of the incoming or outgoing parallel signal lines in each of the network nodes, via a corresponding link.

At the side of the apparatus, given standard line redundancy each network node therefore comprises at least two interface modules, each being connected with a signal line pair for incoming and outgoing lines or, respectively, data or items of information. A hardware

connection, in the sense of the above-mentioned error message link, is provided between the interface modules.

Data coming from a standard processing unit are routed to both interface modules via a known bridge circuit, analogously to the 1+1 line redundancy, and at the output side of the interface modules incoming data or items of information reach the processing unit by means of a selector (likewise known).

Both interface modules of each network node are constantly active, whereby given line errors, or also in case of errors in the interface modules, a line selection between the working line or the protection line is carried out via the selectors, by means of a changeover thereof.

The invention is explained in more detail on the basis of an exemplary embodiment and figures.

Figure 1 shows a block switching diagram of a known module redundancy through parallel arrangement of a standby interface module, and

Figure 2 shows a block switching diagram of a schematic view of the inventive apparatus of interface modules operated in parallel and in the active state in the respective network nodes.

Figure 1 represents a signal transmission path 1 of a network. The signal transmission path 1 comprises a line redundancy 2, namely a signal line Working 3 and a signal line Protection 4.

In the depicted state, the signal line Working 3 is active via the selector 5. This line is accordingly used for the bidirectional transmission of data or, respectively, items of information between nodes (not shown) of the network.

A module redundancy 6 comprises a first interface module 7 and a second interface module 8. With its inputs, the second interface module 8 is connected via couplers 9 to the signal line Working 3 and to the signal line Protection 4. By means of an output-side combination of the

first and second interface modules 7, 8, there results a parallel circuit of the two, which is however fashioned such that in the depicted state only the first interface module 7 is active.

The second interface module 8 is in the standby state. The second interface module 8, in the standby state, is then capable of taking over the traffic if the active module, i.e., the first interface module 7, fails. Accordingly, the second interface module 8 is held **[sic: reserved]** for the failure of the first interface module 7, and there results in principle the problem of an undesired attenuation of data that are transmitted via the signal line path 1 and that reach the signal coupler or, respectively, splitting module 9.

In the exemplary embodiment according to Figure 2, a signal transmission path 1 is in turn depicted that connects a first node 10 with a second node 11 of a network.

In analogy to the 1+1 line redundancy, in each node a hardware module is provided comprising selectors 5 and a bridge 12. Incoming signals, symbolized by arrows, thus reach the bridge circuits 12 as well as two interface modules 13 provided there. An error transmission link 14 is provided between the interface modules 13. Incoming signals to the respective node 10 and 11 are routed to the selector 5, which selects one of the present separate lines and defines this line as a working line.

As can be seen from Figure 2, at the output side the interface modules 13 are routed to the existing line redundancy 2 and in principle are operated in parallel. That is, in normal operation all interface modules 13 are in the active state.

Thus, according to the exemplary embodiment an interface module redundancy and a line redundancy are unified, i.e., with respect to the sought error tolerance the interface modules are regarded as a part of the line. Given failure of one of the interface modules, this failure is handled by a line changeover, using the selectors 5 in the nodes 10, 11.

If a line error is present, in view of the module redundancy 6 shown in Figure 1 it is now not necessary to activate a standby module; rather, due to the fact that in principle both the first

and the second interface modules 7, 8 are active, only a quasi-changeover is carried out. Accordingly, in comparison with known constructions having the same hardware outlay, twice as many signal lines can be operated, whereby the selectors of the 1+1 line redundancy architecture take over the function of the switches (which would otherwise become necessary) in the interface modules according to the prior art. Couplers or signal splitting modules in the signal lines can be omitted.

It has turned out that the solution specified by the above exemplary embodiment can easily be implemented in high-bit-rate SDH/SONET transmission apparatuses, whereby the changeover time in case of error is around 50 milliseconds. The specified 1+1 ACT/ACT redundancy accordingly offers a combined possibility of signal line protection and module protection, so that transmission security and failure security in the data network are correspondingly increased.

Patent claims

1. Method for optimizing transmission security and failure security in high-bit-rate data networks by means of signal line redundancy between network nodes (10, 11), whereby parallel signal lines (3, 4) between the network nodes for the transmission of data or items of information can optionally be occupied, or can be switched, as working lines or protection lines, as well as selectors (5), bridge circuits (12), and interface modules (13) respectively provided at the network node side, whereby an error message link or transmission link (14) is provided between the interface modules (13) of a node (10; 11),

characterized in that

a signal line pair (2), composed of the parallel signal lines (3,4) for incoming or, respectively, outgoing signal lines, is respectively terminated at the network node side with an interface module (13), whereby all interface modules (13) always contain, by means of the bridge circuit (12), the data or items of information that are transmitted via the signal lines (3,4), and, given a failure of one of the interface modules (13), indicated by the error message link or transmission link (14) arranged between the interface modules (13) of a node (10, 11), this error is immediately countered by a signal line changeover, and line errors are immediately countered by the provided interface module redundancy, whereby in addition messages of line errors or of the failure of one of the interface modules (13) can be transmitted between the interface modules (13) of the incoming and outgoing parallel signal lines (3,4) in each of the network nodes, by means of the error message link or transmission link (14) and the selector (5).

2. Method according to claim 1,

characterized in that

with respect to the selection of the respective signal line (3, 4), or, respectively, of the respective signal line pair (2), via which incoming data are forwarded by means of the selector (5), the interface modules (13) are regarded as line components.

3. Apparatus for optimizing transmission security and failure security in high-bit-rate data networks by means of signal line redundancy between the network nodes, whereby parallel

signal lines (3, 4) between the network nodes for the transmission of data or items of information can optionally be occupied, or can be switched, as working lines or protection lines, as well as selectors, bridge circuits, and interface modules respectively provided at the network node side, whereby each network node (10, 11) comprises at least two interface modules (13), and an error message link or transmission link (14) is provided between the interface modules (13) of a node (10; 11),

characterized in that

- each interface module (13) respectively stands in direct connection with a signal line pair (2) for incoming or, respectively, outgoing lines,
- data or items of information coming from a processing unit are routed to the at least two interface modules (13) of a node via the bridge circuit (12), and at the output side of the interface modules (13) incoming data or items of information that are present reach the processing unit by means of the selector (5), whereby
- the at least two interface modules (13) of each network node (10; 11) always contain, by means of the bridge circuit (12), the data or items of information that are transmitted via the signal lines (3,4), and, in case of line errors or interface module errors, by means of a changeover a selection takes place, via the selectors (5), between a working line or a protection line.

Abstract

Method and apparatus for optimizing transmission security and failure security in high-bit-rate data networks

The invention relates to a method and to an apparatus for optimizing transmission security and failure security in high-bit-rate data networks by means of signal line redundancy between the network nodes, whereby parallel signal lines can optionally be occupied, or can be switched, as working lines or protection lines, and selectors, bridge circuits, and interface modules are respectively provided at the network node side. According to the invention, each of the parallel signal lines is connected at the network node side with a respective interface module, whereby all interface modules are in principle in the active state. Given failure of one of the interface modules, this failure is immediately countered by a signal line changeover, and line errors are immediately countered by the provided interface module redundancy. Error messages can be transmitted, via a corresponding link, between the interface modules of the incoming and outgoing parallel signal lines in each of the network nodes.

IN THE UNITED STATES ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

"**REQUEST FOR APPROVAL OF DRAWING CHANGES**"

APPLICANT: Jörg KÖPP et al.

SERIAL NO.: EXAMINER:

FILING DATE: ART UNIT:

INTERNATIONAL APPLICATION NO.: PCT/DE99/01913

INTERNATIONAL FILING DATE: 1 July 1999

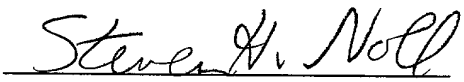
INVENTION: METHOD AND DEVICE FOR OPTIMISING THE TRANSMISSION SAFETY AND THE DEFECT TOLERANCE IN HIGH-BIT-RATE DATA NETWORKS

Hon. Assistant Commissioner for Patents
Box PCT
Washington D.C. 20231

SIR:

Applicants herewith request approval of the drawing changes in each of Figures 1 and 2, as shown on the drawing copies marked in red attached hereto.

Respectfully submitted,



Steven H. Noll (reg. no. 28,982)
Schiff Hardin & Waite
Patent Department
6600 Sears Tower
Chicago, Illinois 60606
Telephone: 312-258-5790

ATTORNEY FOR APPLICANT

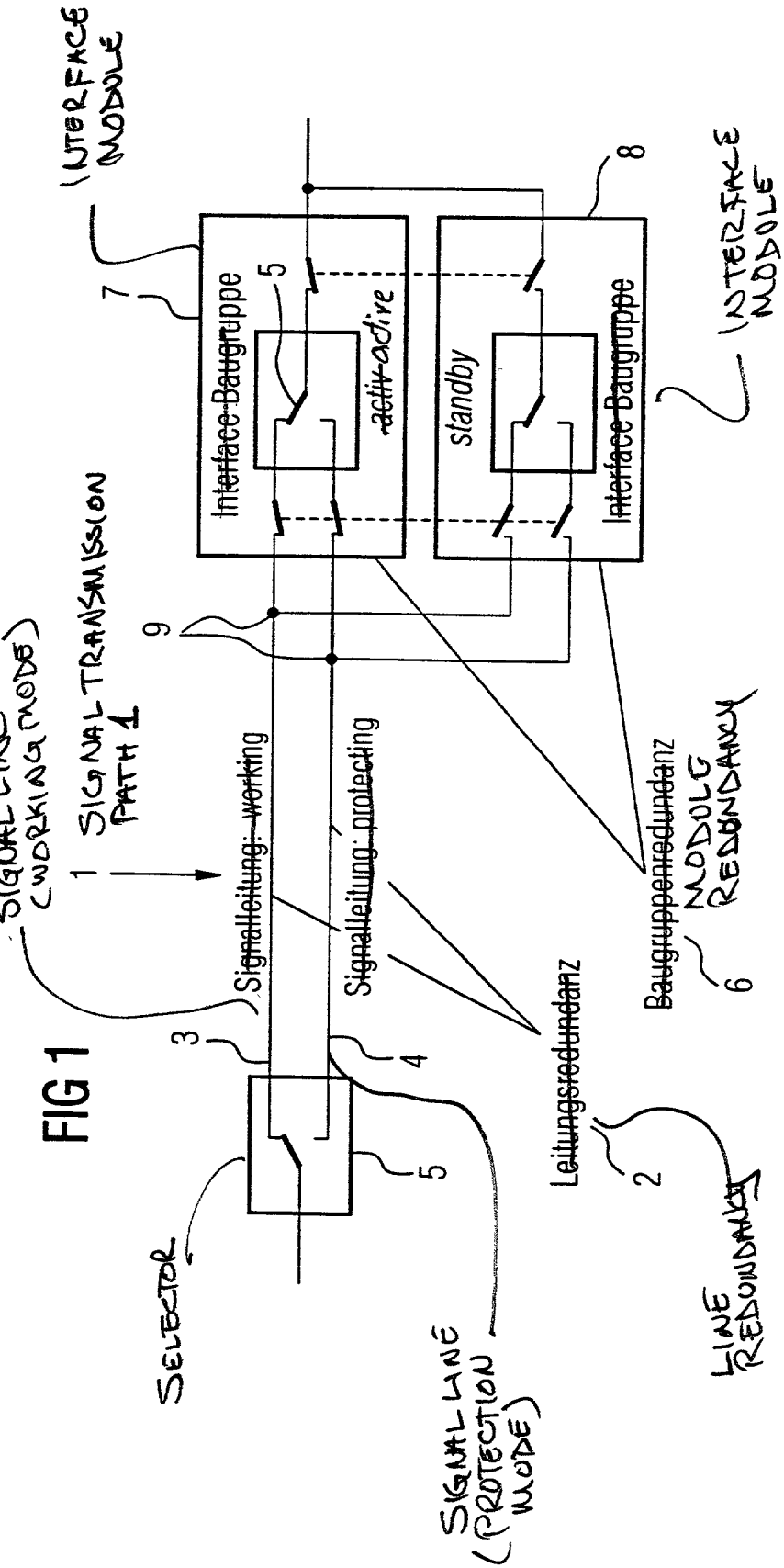

INTERFACE MODULE
7
8
Interface-Baugruppe
5
activ-active
standby
Interface-Baugruppe
INTERFACE MODULE
9
SIGNAL LINE (WORKING MODE)
1
SIGNAL TRANSMISSION PATH 1
Signalleitung: working
Signalleitung: protecting
3
4
5
Baugruppenredundanz
MODULE REDUNDANCY
6
Leitungsredundanz
2
SELECTOR
SIGNAL LINE (PROTECTION MODE)
LINE REDUNDANCY

FIG 1

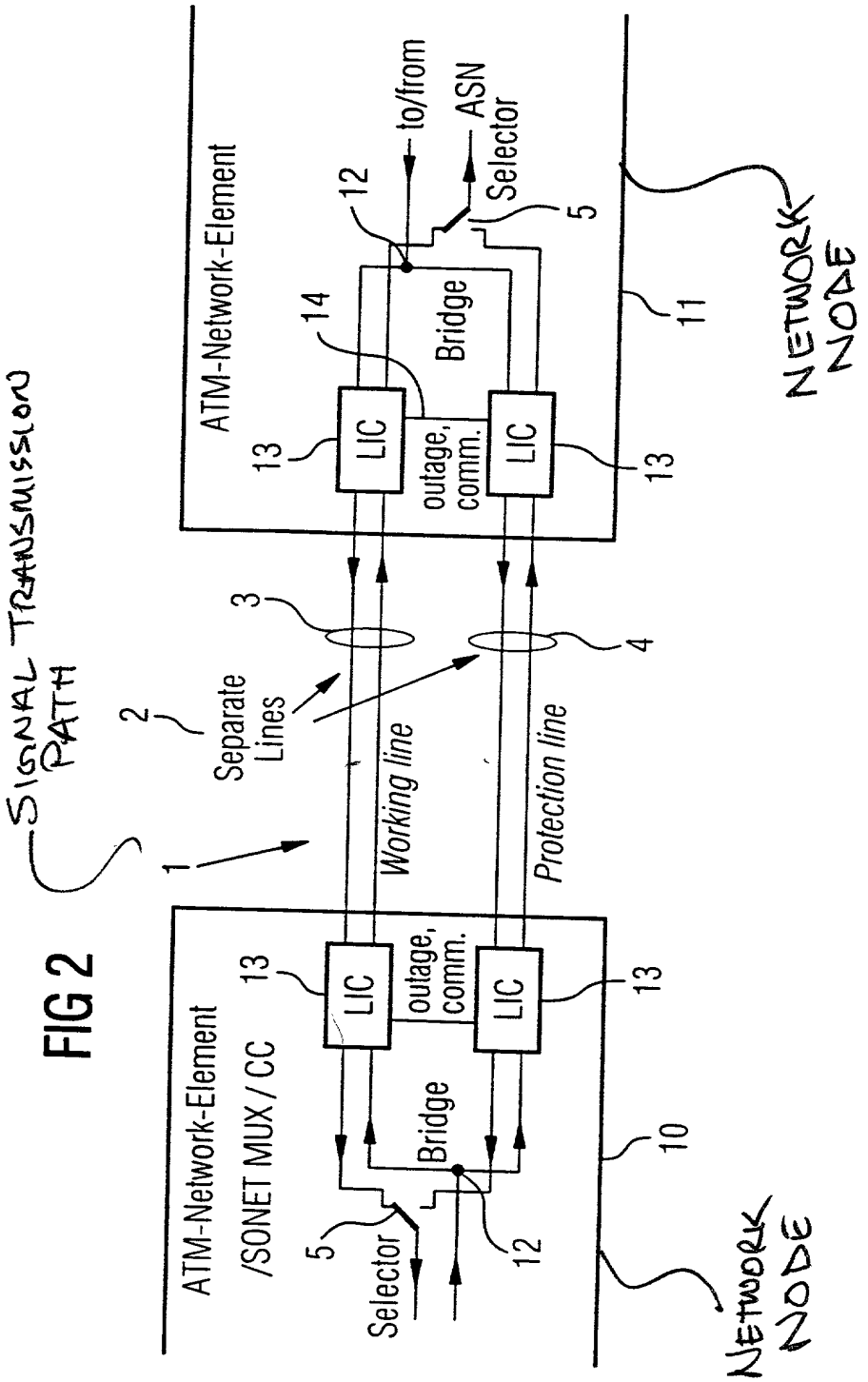

SIGNAL TRANSMISSION PATH
1
2
Separate Lines
3
4
Working line
Protection line
ATM-Network-Element
/SONET MUX / CC
ATM-Network-Element
13
LIC
outage, comm.
LIC
13
Bridge
12
to/from
ASN
Selector
5
14
Bridge
12
5
Selector
10
11
NETWORK NODE
NETWORK NODE

FIG 2

Declaration and Power of Attorney For Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

As a below named inventor, I hereby declare that

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

My residence, post office address and citizenship are as stated below next to my name,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Verfahren und Vorrichtung zur Effektivierung der Übertragungs- und Ausfallsicherheit in Hochbitratigen Datennetzen

deren Beschreibung

the specification of which

(zutreffendes ankreuzen)

☒ hier beigefügt ist.

☐ am _____ als PCT internationale Anmeldung PCT Anmeldungsnummer _____ eingereicht wurde und am _____ abgeändert wurde (falls tatsächlich abgeändert)

(check one)

☐ is attached hereto

☐ was filed on _____ as PCT international application PCT Application No _____ and was amended on _____ (if applicable)

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeandert wurde

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a)

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen fur ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign appplications
Priorität beansprucht

			Priority Claimed	
198 31 562.7	Germany	14. Juli 1998	☒	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1 56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgeben)	(Status) (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklarung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemass Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefangnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

"CHANGE OF ADDRESS OF APPLICANTS' REPRESENTATIVE"

APPLICANT: Jörg KÖPP et al.

SERIAL NO.: EXAMINER:

FILING DATE: ART UNIT:

INTERNATIONAL APPLICATION NO.: PCT/DE99/01913

INTERNATIONAL FILING DATE: 1 July 1999

INVENTION: METHOD AND DEVICE FOR OPTIMISING THE TRANSMISSION SAFETY AND THE DEFECT TOLERANCE IN HIGH-BIT-RATE DATA NETWORKS

Hon. Assistant Commissioner for Patents
Washington, D.C. 20231

SIR:

Members of the firm of Hill & Simpson designated on the original Power of Attorney have merged into the firm of Schiff Hardin & Waite. All future correspondence for the above-referenced application therefore should be sent to the following address:

SCHIFF HARDIN & WAITE
Patent Department
6600 Sears Tower
233 South Wacker Drive
Chicago, Illinois 60606

Submitted by,

Steven H. Noll (Reg. 28,982)

Schiff Hardin & Waite
Patent Department
6600 Sears Tower
233 South Wacker Drive
Chicago, Illinois 60606
Telephone: 312-258-5790
ATTORNEYS FOR APPLICANT

German Language Declaration

VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwälte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschäfte vor dem Patent- und Warenzeichenamt. *(Name und Registrationsnummer anführen)*

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

And I hereby appoint

Messrs. John D. Simpson (Registration No. 19,842) Lewis T. Steadman (17,074), William C. Stueber (16,453), P. Phillips Connor (19,259), Dennis A. Gross (24,410), Marvin Moody (16,549), Steven H. Noll (28,982), Brett A. Valiquet (27,841), Thomas I. Ross (29,275), Kevin W. Guynn (29,927), Edward A. Lehmann (22,312), James D Hobart (24,149), Robert M. Barrett (30,142), James Van Santen (16,584), J. Arthur Gross (13,615), Richard J. Schwarz (13,472) and Melvin A. Robinson (31,870), David R. Metzger (32,919), John R Garrett (27,888) all members of the firm of Hill, Steadman & Simpson, A Professional Corporation.

Telefongespräche bitte richten an: *(Name und Telefonnummer)*

Direct Telephone Calls to: *(name and telephone number)*

312/876-0200
Ext. _____

Postanschrift:

Send Correspondence to:

HILL, STEADMAN & SIMPSON
A Professional Corporation
85th Floor Sears Tower, Chicago, Illinois 60606

Voller Name des einzigen oder ursprünglichen Erfinders: KÖPP, Jörg	Full name of sole or first inventor:
Unterschrift des Erfinders Datum Jörg Köpp 15.06.99	Inventor's signature Date
Wohnsitz D-81476 München, Germany DEX	Residence
Staatsangehörigkeit Bundesrepublik Deutschland	Citizenship
Postanschrift Liesl-Karlstadt-Str. 15	Post Office Addess
D-81476 München Bundesrepublik Deutschland	
Voller Name des zweiten Miterfinders (falls zutreffend). KLUG, Andreas	Full name of second joint inventor, if any:
Unterschrift des Erfinders Datum Andreas Klug 1.07.99	Second Inventor's signature Date
Wohnsitz D-83607 Holzkirchen, Germany DEX	Residence
Staatsangehorigkeit Bundesrepublik Deutschland	Citizenship
Postanschrift Roggersdorfer Str. 60A	Post Office Address
D-83607 Holzkirchen Bundesrepublik Deutschland	

(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).